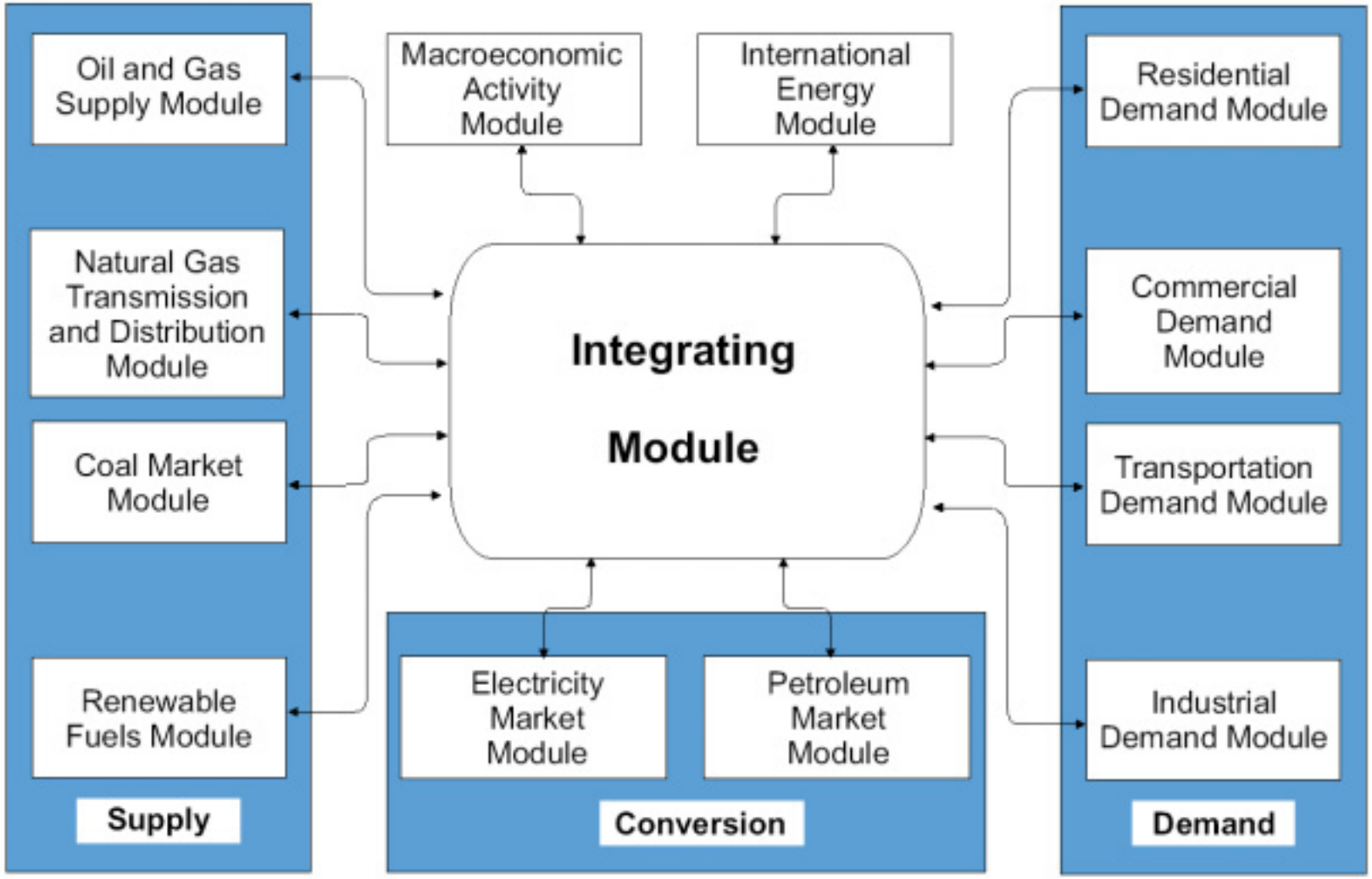
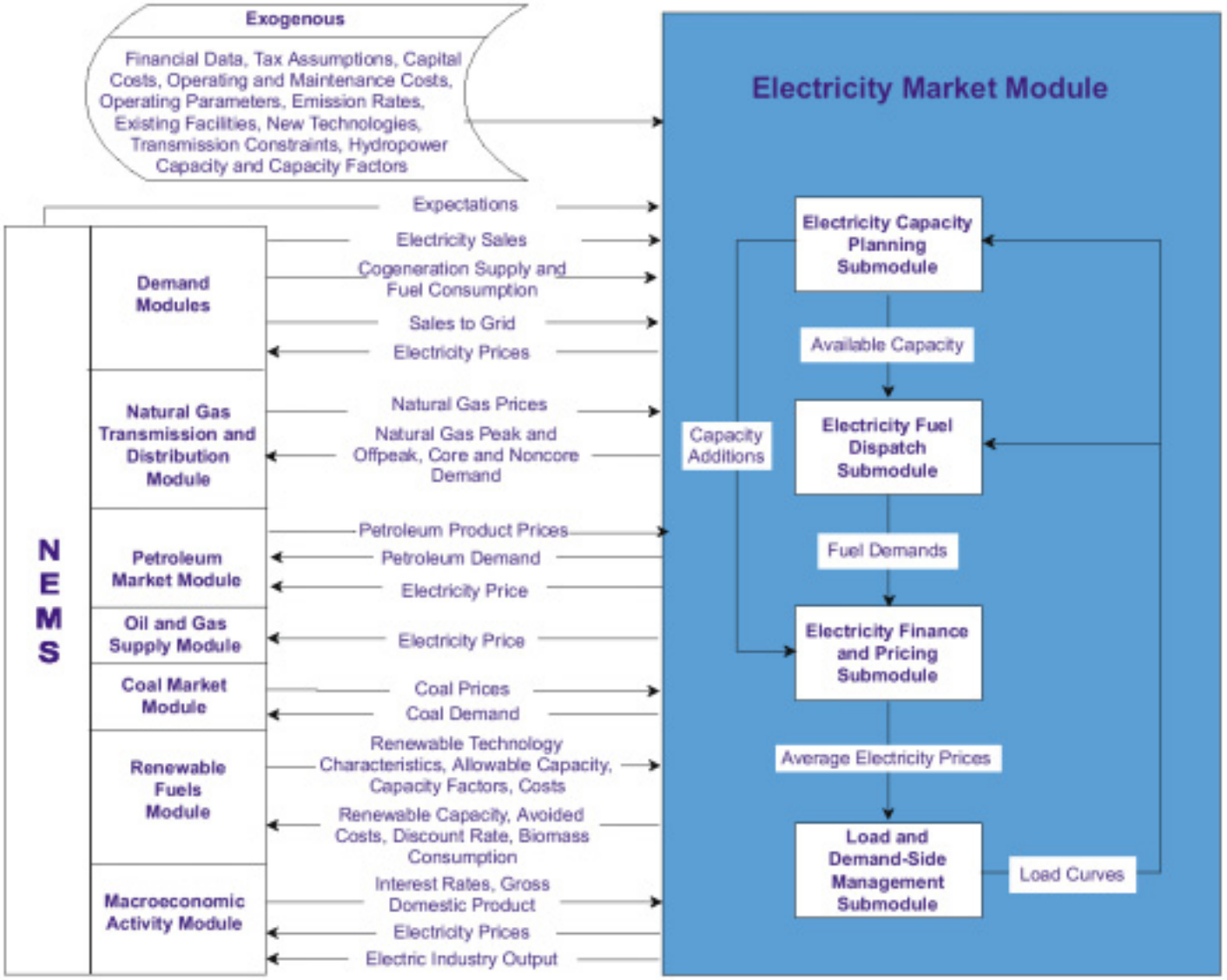
National Energy Modeling System



National Energy Modeling System Overview

- NEMS is a large, regional, modularly designed, technology-rich, energy-economy model that solves for annual equilibrium in U.S. energy markets.
- Consists of:
  - 4 domestic supply modules
    - oil supply, natural gas supply and distribution, coal supply and distribution, and renewable resource supply
  - 4 demand modules
    - residential, commercial, transportation, and industrial
  - Electricity market module
  - Petroleum market module
  - Macroeconomic module
  - International energy module
- Each module represents the operational and planning activities of the appropriate economic agent (i.e., households in the residential module, power companies and power plants in the electricity module) in that area

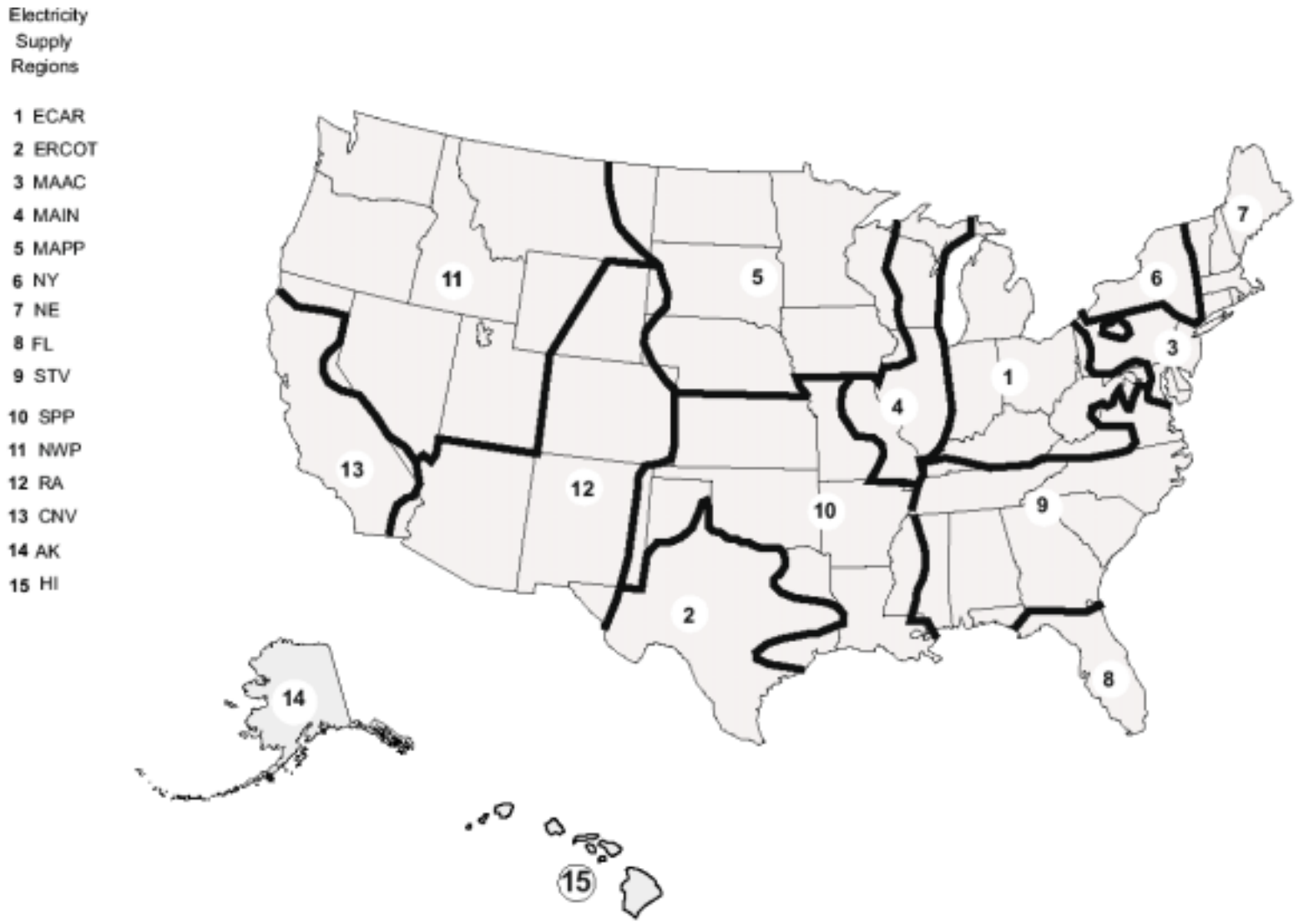
Electricity Market Module



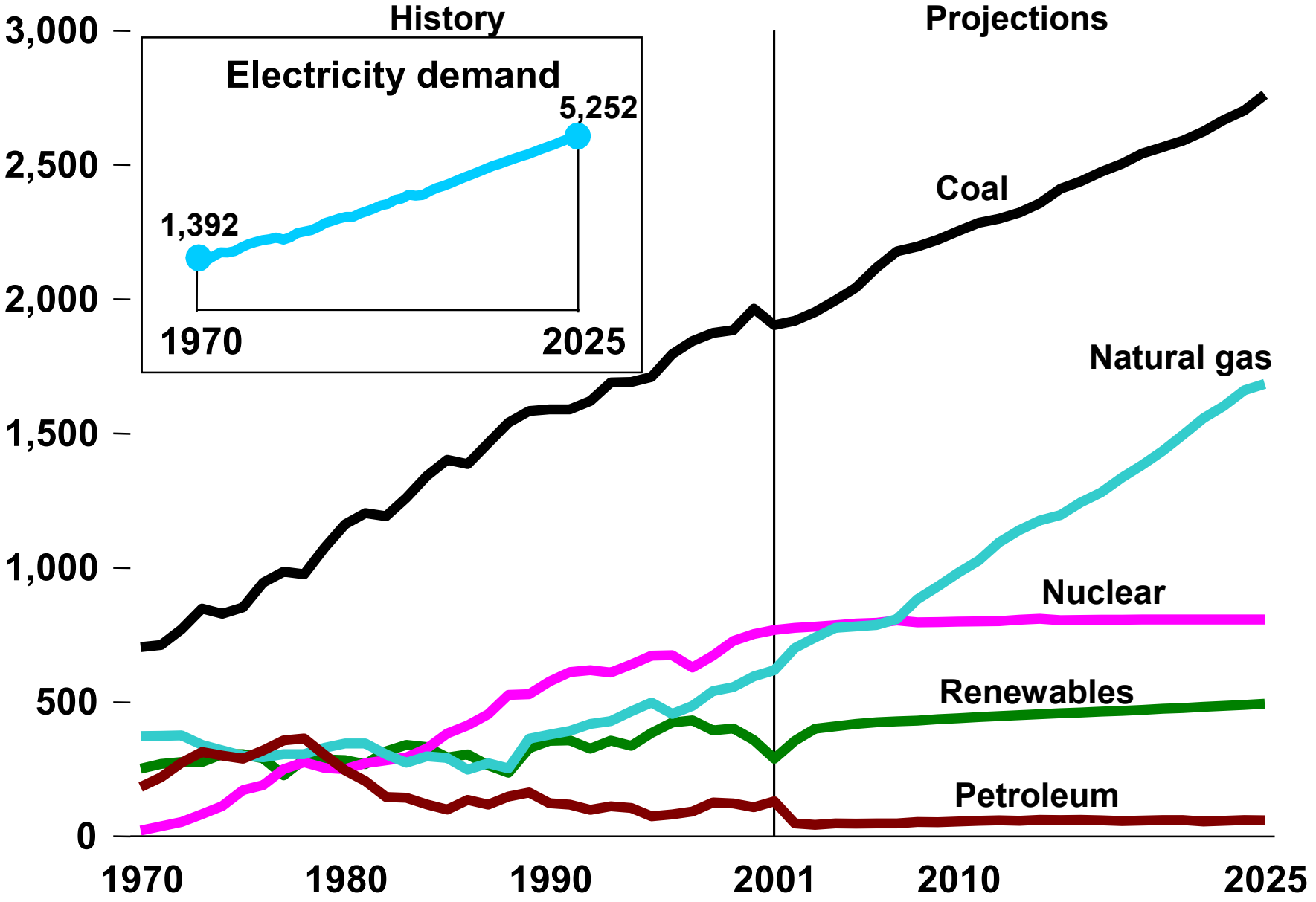
Electricity Market Module

- Linear programming model solving for the minimal cost of meeting electricity demand subject to environmental constraints
- 13 electricity supply regions based on NERC regions and subregions
- Each year using adaptive foresight on future electricity demand and fuel prices determines the best mix of capacity to add, retire, and operate
- 16 new plant types are represented
- Among existing coal plants, 32 different configurations with various combinations of SO2, NOx, particulate, and mercury control devices are represented
- The electricity module explicitly represents the emission caps imposed by multi-pollution statutes and determines the most economical compliance options.
- Banking decisions are made endogenously for SO2, they are exogenously specified for NOx, and Hg

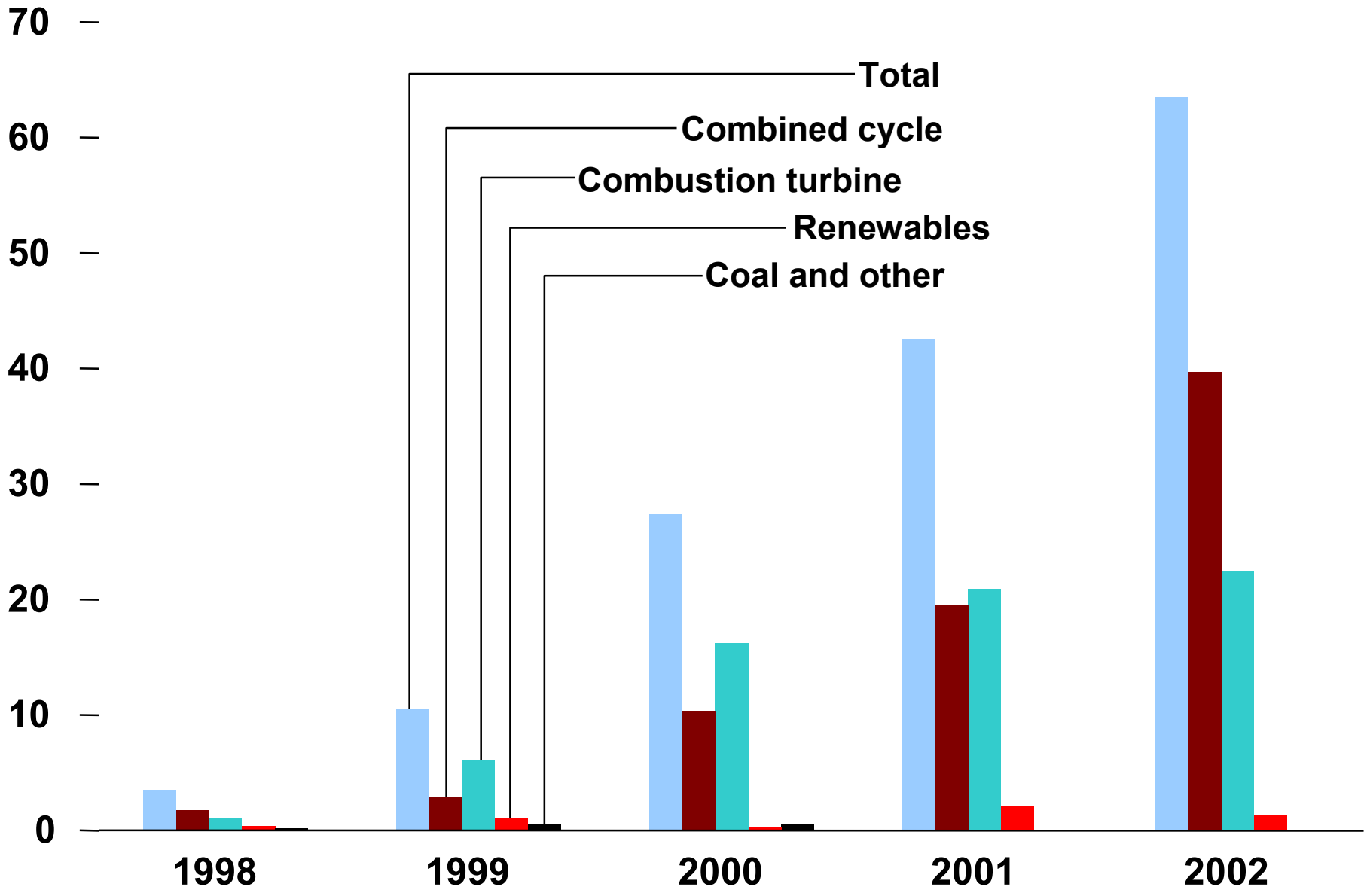
Electricity Regions



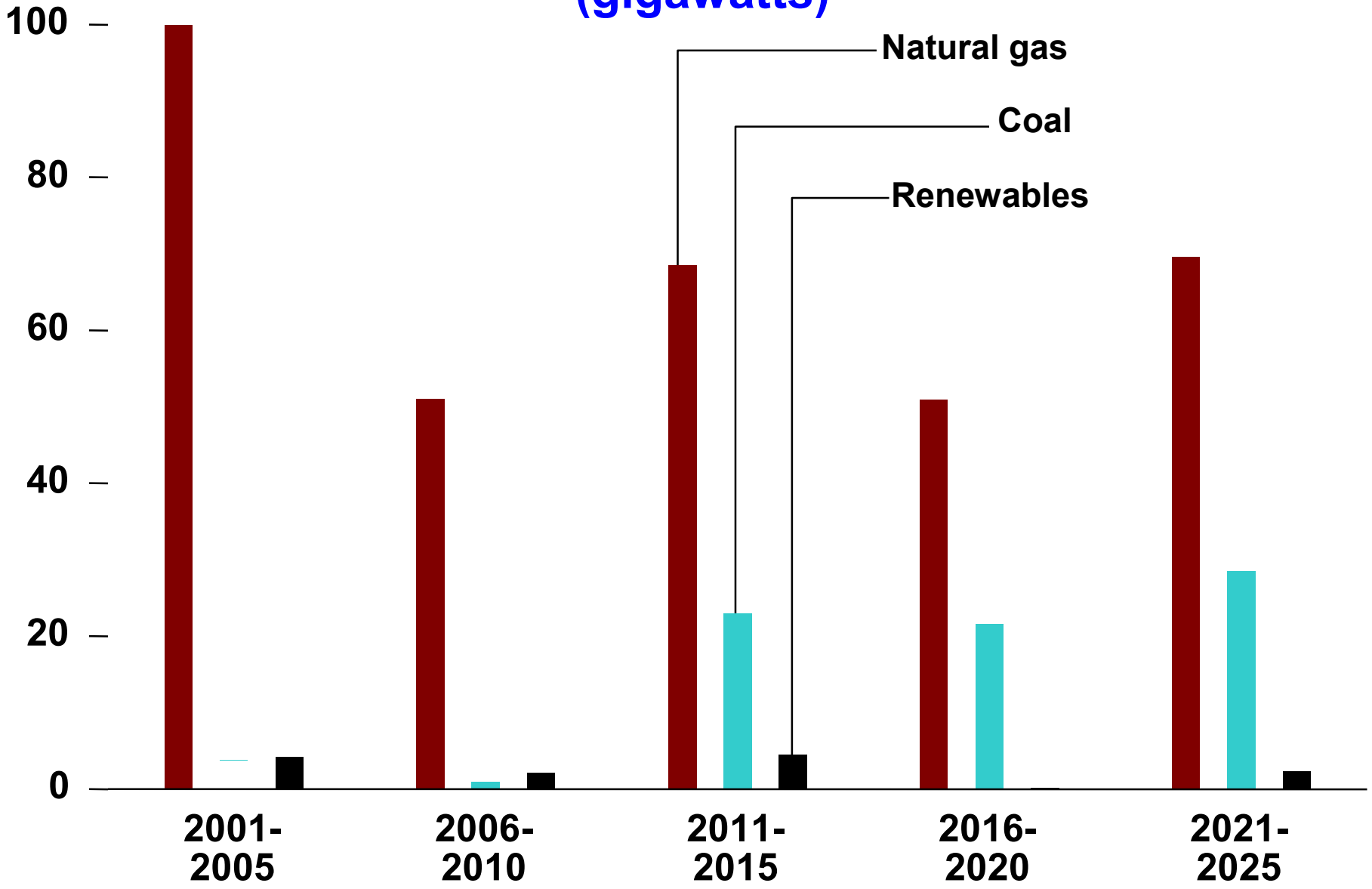
Electricity Generation by Fuel, 1970-2025
(billion kilowatthours)



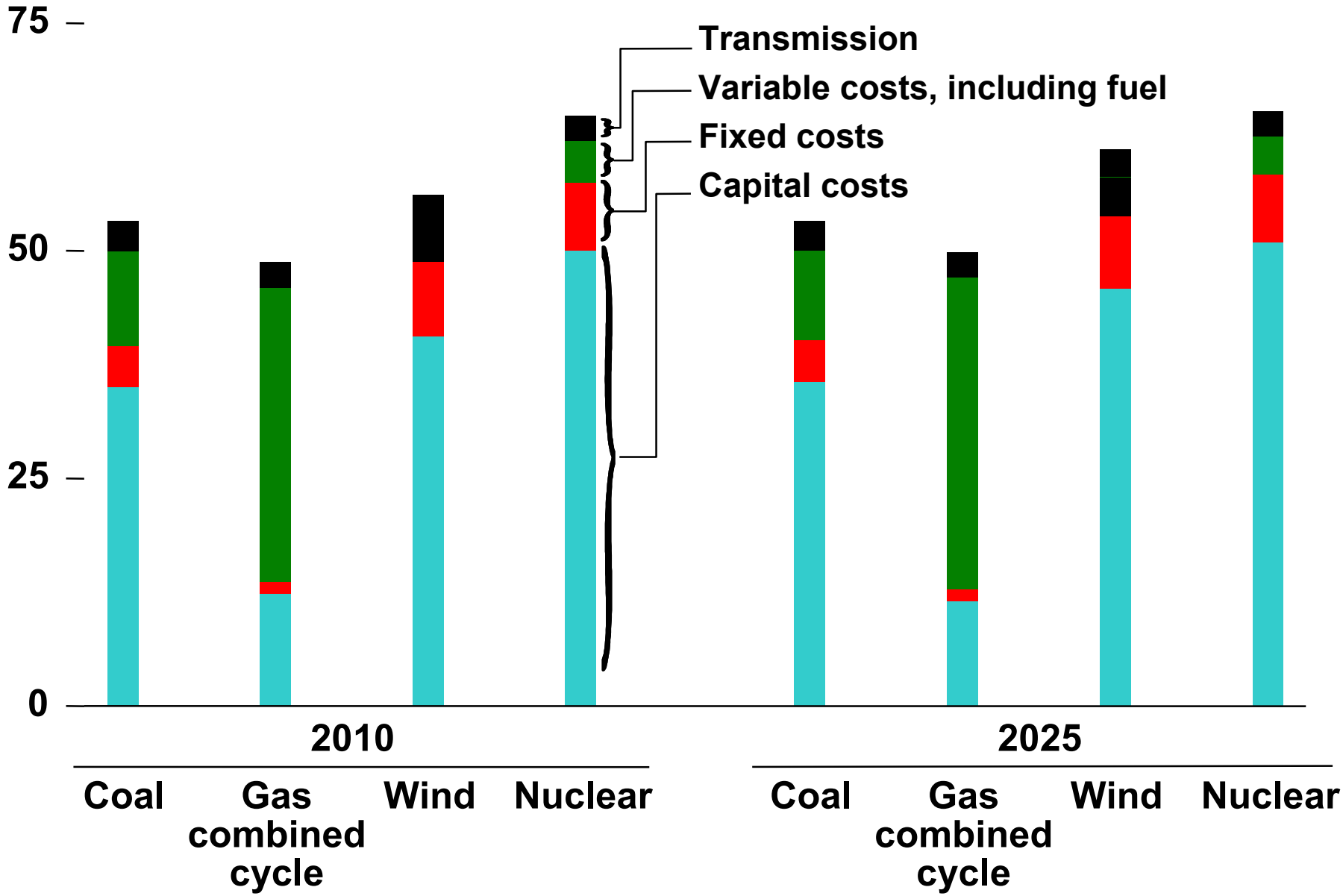
Additions to Electricity Generating Capacity, 1998-2002 (gigawatts)



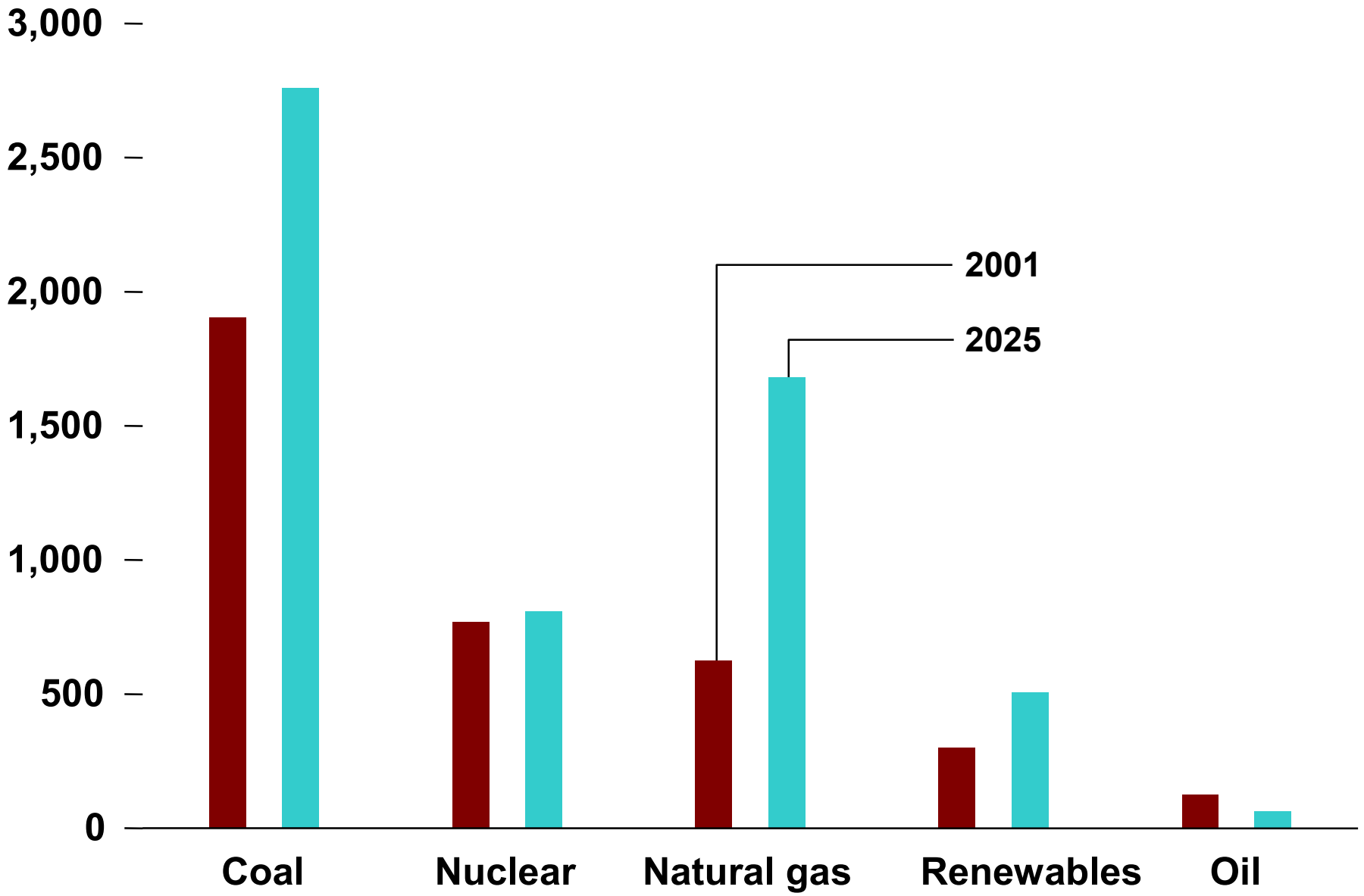
Projected Electricity Generation Capacity Additions by Fuel Type, Including Combined Heat and Power, 2001-2025 (gigawatts)



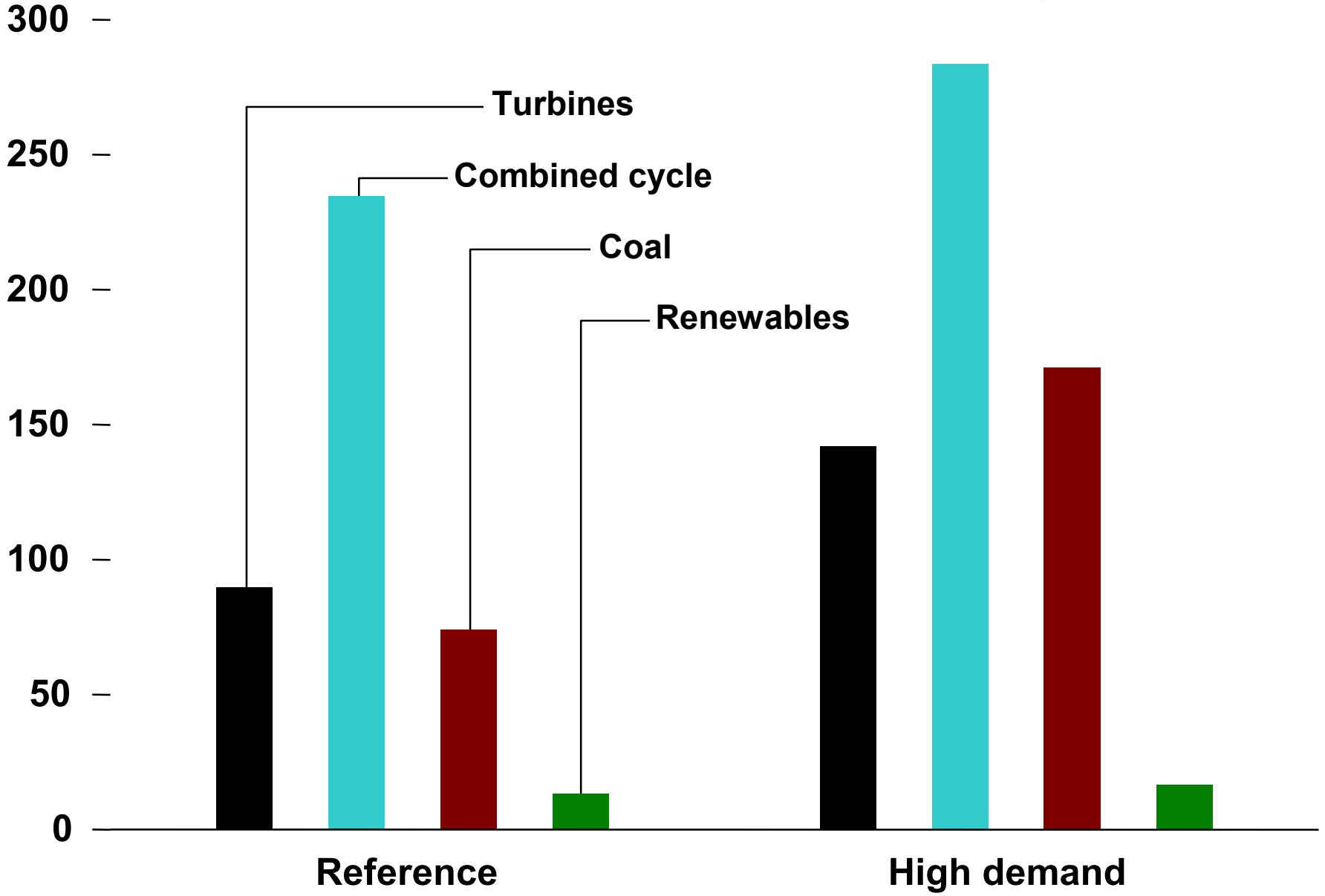
Projected Levelized Electricity Generation Costs, 2010 and 2025 (2001 mills per kilowatthour)



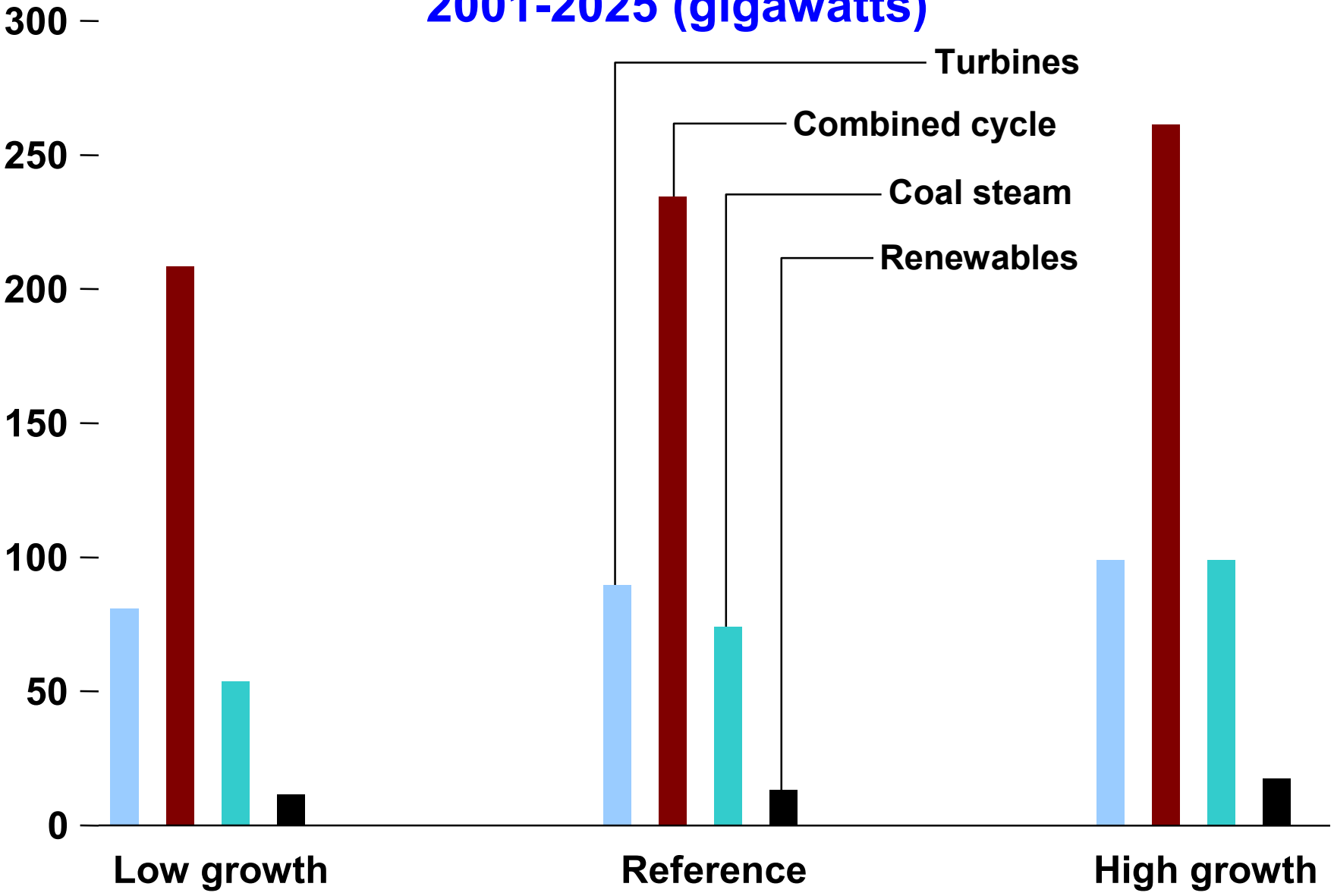
Projected Electricity Generation by Fuel, 2001 and 2025 (billion kilowatthours)



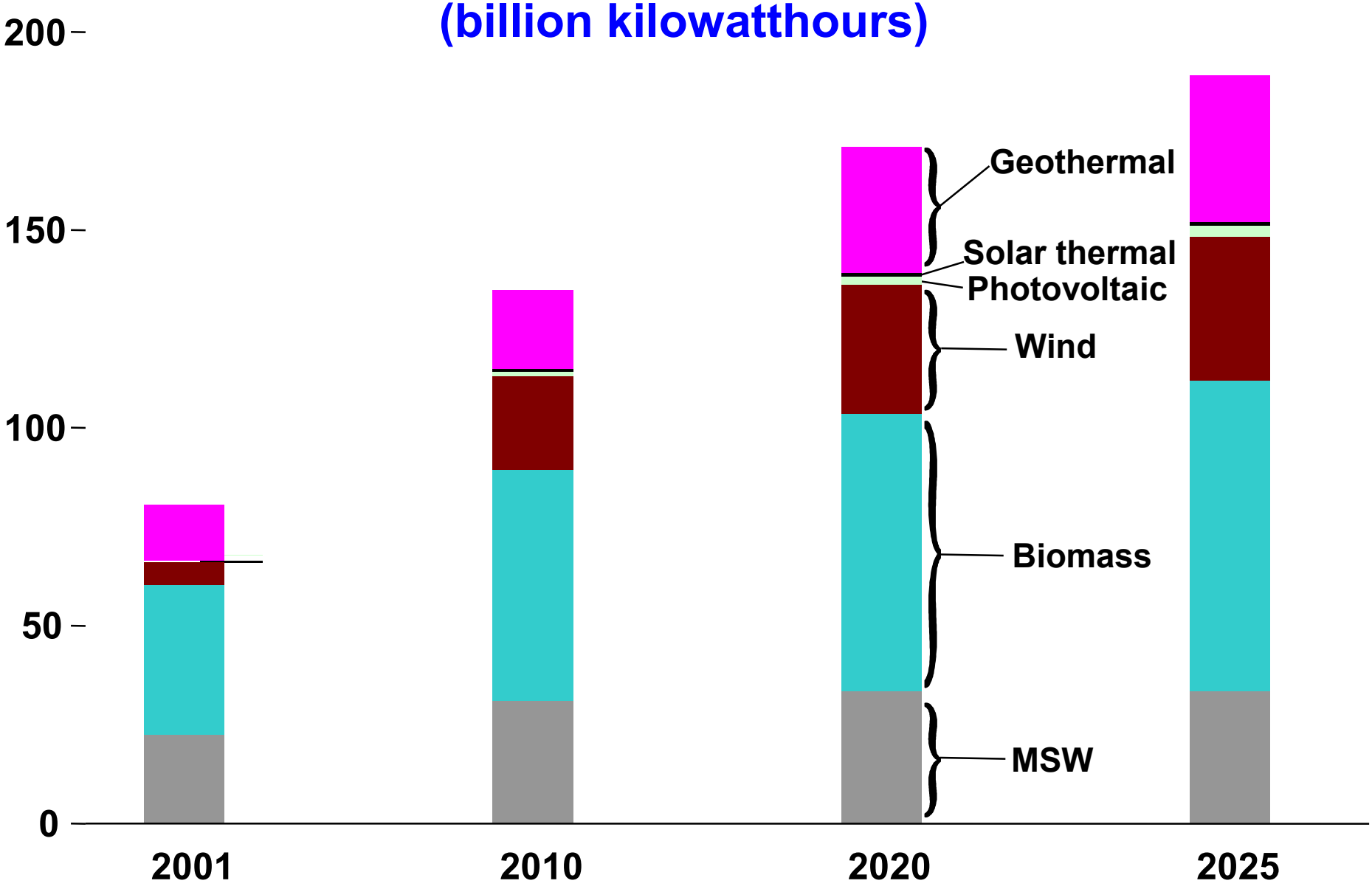
Projected Cumulative New Generating Capacity by Type in Two Cases, 2001-2025 (gigawatts)



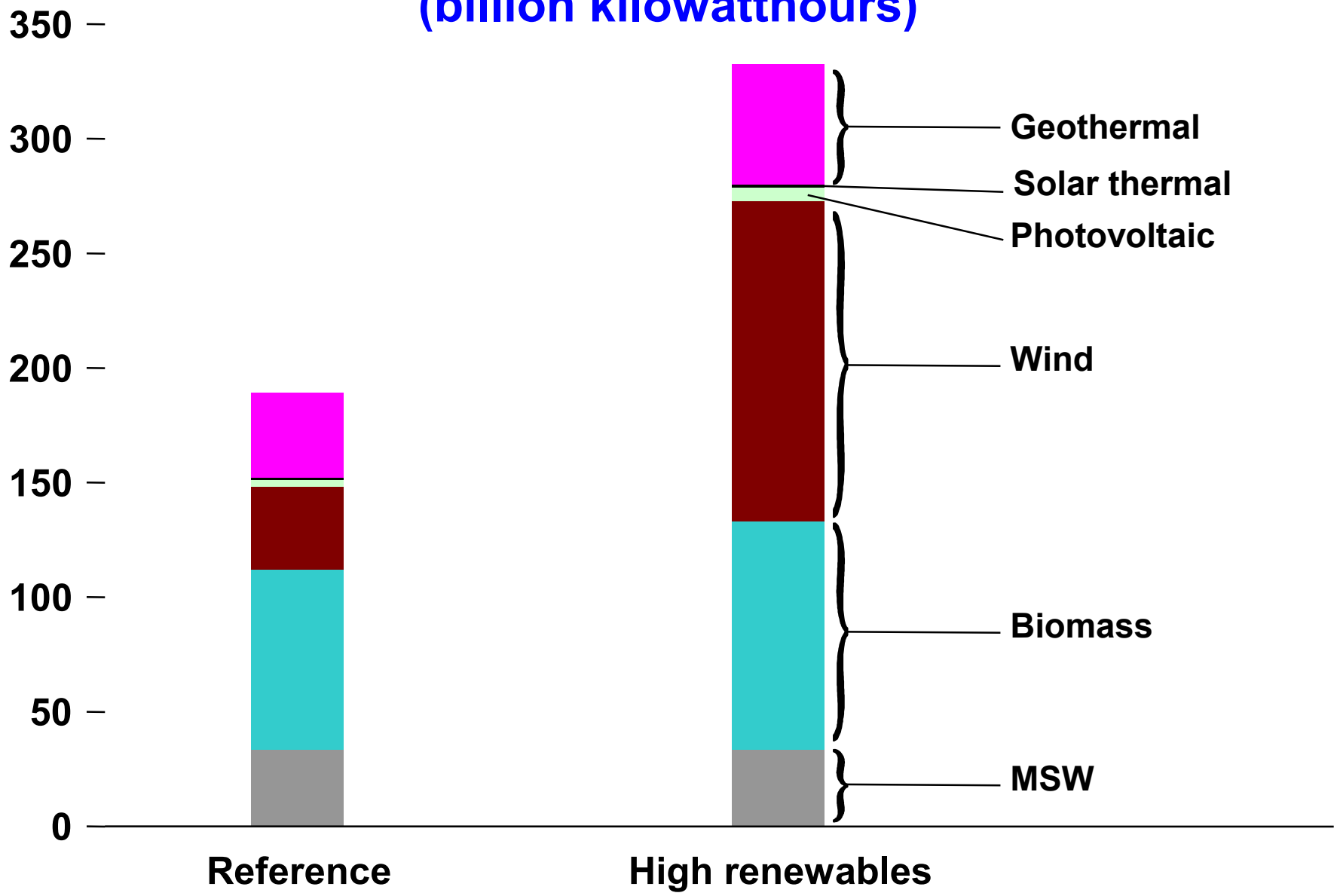
Projected Cumulative New Generating Capacity by Technology Type in Three Economic Growth Cases, 2001-2025 (gigawatts)



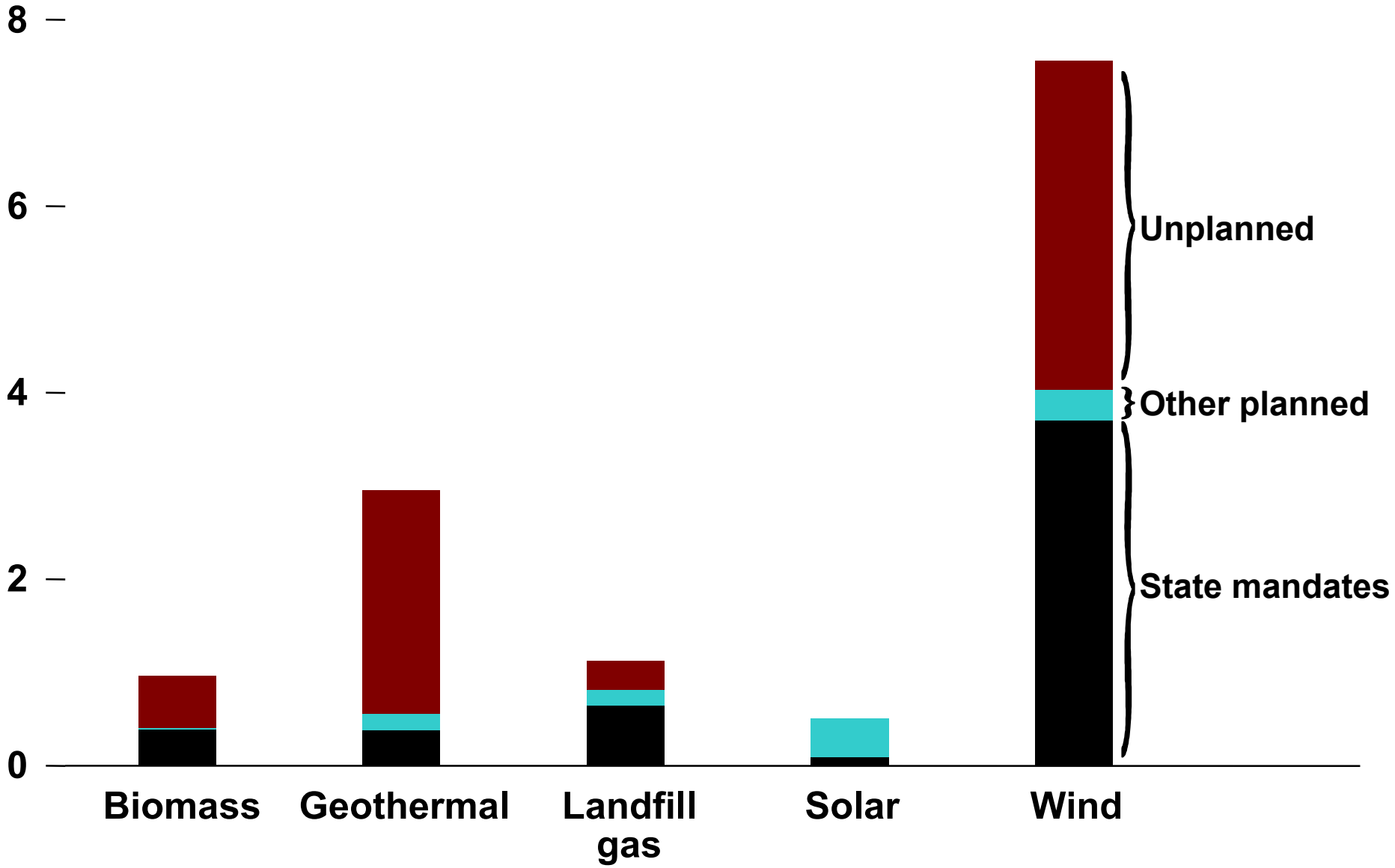
Projected Nonhydroelectric Renewable Electricity Generation By Energy Source, 2010, 2020, and 2025 (billion kilowatthours)



Projected Nonhydroelectric Renewable Electricity Generation By Energy Source in Two Cases, 2025 (billion kilowatthours)



Projected Additions of Renewable Generating Capacity, 2001-2025 (gigawatts)



Green Power in NEMS

- Defined as “Individual consumers voluntarily paying a premium for specified renewables,” NEMS does not explicitly represent green power in any sector
- Green power markets appear to be (1) too small and (2) generally accounted by other EIA/NEMS measures, voiding any immediate necessity of representing separately.

Green Power is Implicitly Included In -

- Supplemental Adds – Supply Side, Explicit annual forecast estimates of known new renewable energy capacity and state RPS, mandates, etc.
- Supply Side – “Floor” grid-connected PV builds
- Demand Side – End-User (both assumed and cost modeled) PV additions in residential and commercial sectors

Should NEMS Model Green Power?

- GP appears to be a very small market
- GP appears generally absorbed in other markets already represented
- GP may have been overtaken by more potent forces, like state RPS
- If evidence demonstrates GP independently adding significant capacity not already accounted, EIA would likely reconsider.